ALGAE OF THE PANAMA CANAL AND ITS TRIBUTARIES
I. FLAGELLATED ORGANISMS

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Although the Panama Canal very well might be considered as an ecological entity, it has been pointed out (Prescott, 1951) that there is considerable variation in water chemistry and other factors throughout the length of the Canal. These differences are correlated with variations in the algal flora in different areas and reaches so that a survey has resulted in an extensive and heterogeneous list of species. Inasmuch as few reports have been made on the algal flora of the Canal (Ostenfeld and Nygaard, 1925; Prescott, 1936, 1951; Drouet, 1937), the author proposes to deal with the species taxonomically in a series of papers of which this is the first. Herein are considered the flagellate members of several Divisions of algae, Chlorophyta, Chrysophyta, Euglenophyta, Pyrrhophyta which appear in collections to date. It is hoped that such a treatment will be of interest not only to the general phycologist, but also to others concerned with the aquatic biology of the Canal, particularly those interested in the food chain and feeding of aquatic animals including mosquito larvae.

As mentioned before (Prescott, 1951) the taxonomic work is based upon collections made by the author in 1938, and those of Drs. G. W. Martin, Carol Dodge, and A. M. Chickering. The author also made a few additional collections in January, 1953.

CHLOROPHYTA

Chlamydomonas incerta Pascher

Cells spherical or nearly so, inclosed in a relatively close gelatinous membrane without apical papilla; chloroplast semi-reticulate, covering most of the wall, with a prominent basal pyrenoid; pigment-spot lateral in the anterior end; cells 17.5 μ in diameter. Pl. 5, Fig. 6.

CZ–209. Rio Chilibres.

The genus *Chlamydomonas* is undoubtedly represented by many species in the Panama Canal region, but *C. incerta* is the only one which has appeared in collections. Of the globular species which have no apical papilla this is the largest. The chloroplast is definitely cup- or urn-shaped and (in ours) padded and somewhat reticulate.

Gonium pectorale Müller

Cells broadly elliptic or egg-shaped, arranged in one plane to form flat, somewhat rectangular plates, usually 16 cells in each colony; cells with the narrower pole extended outwardly and with flagella of the marginal cells directed parallel with the plane of the colony, interior cells with flagella directed at right angles to the colonial plane; colonial mucilage wide and reticulate, each cell being inclosed in a sheath interconnected with sheaths of neighboring individuals by narrow processes so that interstices are produced; chloroplast cup-shaped with a basal pyrenoid; pigment-spot anterior and lateral; colony swimming in a tumbling fashion; cells 8–10 μ in diameter, 12–14 μ long. Pl. 6, Fig. 4.

CZ–211. Rio Chagres.

Eudorina elegans Ehr.

Colony oval or subspherical, with a wide gelatinous sheath; cells spherical, arranged at the periphery of the colonial envelope, usually in transverse tiers; chloroplast cup-shaped with a basal or central pyrenoid; pigment-spot lateral in the apical region; the two flagella parallel as they pass through the colonial mucilage and then widely divergent; cells averaging 12 μ in diameter. Pl. 6, Fig. 5.

This very common and widely distributed species was found to be very abundant in the plankton of Gatun Lake, often occurring with *E. unicocca* G. M. Smith in several regions of the Canal.

Eudorina interconnexa sp. nov.

Colony oval, the gelatinous sheath wide and sometimes slightly produced to form lobes posteriorly; cells spherical, 32 in number, bearing a pair of prominent gelatinous canals anteriorly through which the flagella extend; cells inclosed in individual sheaths which are interconnected with neighboring cells by slender strands so that a fenestration is formed within the colonial mucilage; cells. 10–18.5 μ in diameter; colony 89 μ in diameter. Pl. 6, Fig. 3.

CZ–26; CZ–34. Gatun Lake plankton, especially in Gigante Bay.

This species is similar to *E. elegans* in most respects but differs in the possession of individual cell sheaths which are interconnected. In none of the colonies do the cells show the tiered arrangement characteristic of *E. elegans*. Another characteristic which is presumed to be specific is the possession of canal-like processes through which the flagella extend. These show particularly in preserved material.

Colonia ovata, vagina gelatinosa lata, interdum, ad lobos postice formandos, aliquantum producta; cellulae sphericae, 32 numero, pari fossarum gelatinosarum manifestarum per quas flagella egrediuntur antice praeditae; cellulae in vaginis singulis, per ligamenta tenuia cellulis propinquis interconnexis, fenestrationem intra mucilaginem colonialem formantes, inclusae; cellulae 10–18.5 μ diam., colonia 89 μ diam.

Eudorina unicocca G. M. Smith

Colony irregularly pyriform or ovate, the sheath wide and narrowed slightly posteriorly where it becomes somewhat extended to form four broad lobes; cells 24–32 in number, spherical or broadly oval, (in ours), with a pair of prominent canals through which the flagella extend; cells rather closely arranged in about 4 tiers within the colonial envelope; cells 10.8 μ in diameter. Pl. 5, Fig. 13, 14.

CZ–26. Found only in the plankton of Gatun Lake where it occurs with *E. elegans*.

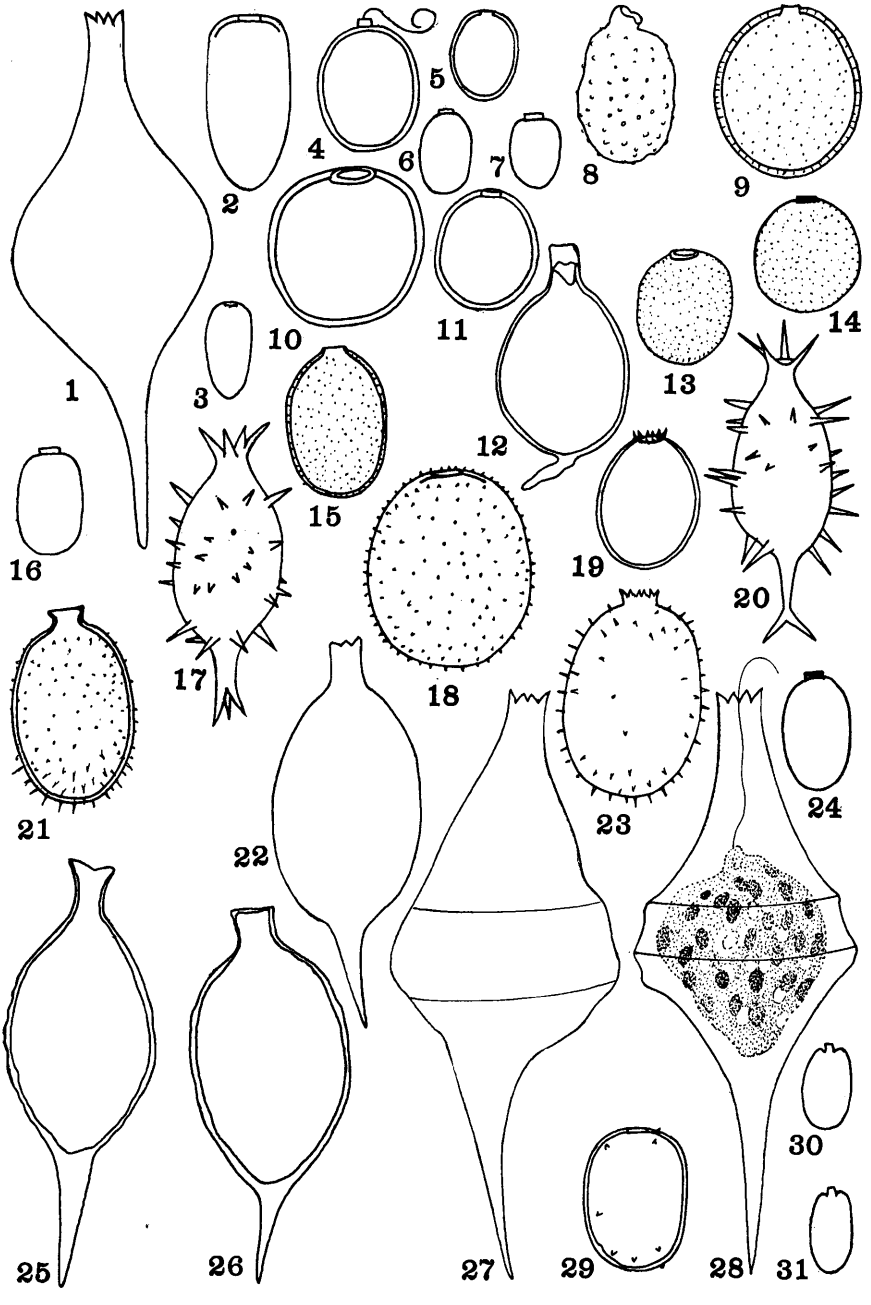
Pleodorina californica Shaw

Colony spherical, with 64–128 spherical or ovate, flagellated cells of two sizes, the smaller cells being located in the posterior region of the colony, the larger (about half the total number) being reproductive and located anteriorly in the colony; larger cells 10–14–(23) μ in diameter, smaller cells 8–11 μ in diameter; large colonies up to 400 μ in diameter. Pl. 6, Fig. 7.

CZ–204. Plankton in Gatun Lake.

EXPLANATION OF FIGURES IN PLATE I

1. *Trachelomas ensifera* var. *dentifera* var. nov.
2–3. *Trachelomonas cylindrica* var. *decollata* Playf.
4. *Trachelomonas Manginii* Defl.
5. *Trachelomonas oblonga* Lemm.
6–7. *Trachelomonas oblonga* var. *attenuata* Playf.
8. *Trachelomonas scabra* var. *longicollis* Playf.
9. *Trachelomonas Kelloggii* var. *punctata* Skv.
10. *Trachelomonas Dybowskii* Drez.
11. *Trachelomonas Dybowskii* Drez. Fa.
12. *Trachelomonas fluviatilis* var. *curvicauda* var. nov.
13. *Trachelomonas intermedia* Dang.
14. *Trachelomonas volvocina* Ehr.
15. *Trachelomonas hispida* var. *punctata* Lemm.
16. *Trachelomonas cylindrica* Ehr.
17. *Trachelomonas speciosa* var. *spinosa* var. nob.
18. *Trachelomonas hispida* (Perty) Stein
19. *Trachelomonas hispida* var. *papillata* var. nov.
20. *Trachelomonas pisciformis* sp. nov.
21. *Trachelomonas subflava* sp. nov.
22. *Trachelomonas fluviatilis* var. *curvata* Lemm.
23. *Trachelomonas hispida* var. *coronata* Lemm.
24. *Trachelomonas pulcherrima* var. *latior* fa. *collarita* fa. nov.
25–26. *Trachelomonas fluviatilis* var. *rugosa* var. nov.
27–28. *Trachelomonas napiformis* sp. nov.
29. *Trachelomonas hispida* var. *papillata* var. nov.
30–31. *Trachelomonas pulcherrima* ver. *elevatum* var. nov.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Pleodorina illinoisensis Kofoid

Colony spherical or subspherical, with 32 to 64 spherical or broadly oval, flagellated cells arranged near the periphery, 4 of the cells being distinctly smaller and located at the posterior pole or to one side of the colony; larger cells 16 μ in diameter, smaller vegetative cells 11.5 μ in diameter. Pl. 6, Fig. 8.

CZ–56; CZ–26. Plankton of Gatun Lake, near Orchid Island.

Pascher (1927) has reduced the name of this organism to *Eudorina illinoisensis* (Kofoid) Pascher.

Volvox aureus Ehr.

Colony relatively large, spherical, with as many as 3200 ellipsoidal, flagellated cells arranged at the periphery of the colonial mucilage, colony visible to the unaided eye; cells without individual sheaths, the intercellular processes usually fine and sometimes difficult of determination; colonies usually dioecious; daughter colonies 2–4–(6) within the parent colony; female colonies with as many as 21 eggs; male colonies with many cells (sometimes one-half of the individuals) forming spermatozoid bundles; cells 4–8 μ in diameter; zygotes with smooth walls, 32–62 μ in diameter. Pl. 7, Fig. 1.

CZ–2. Plankton in Gatun Lake.

EUGLENOPHYTA

Euglena acus Ehr.

Cells elongate-cylindric, narrowed anteriorly, with the apex truncate and slightly bilobed; narrowed posteriorly to form a relatively long, sharply pointed caudus; pellicle spirally striated (sometimes very faintly so); chloroplasts numerous, somewhat irregularly shaped discs, often showing in slightly spiral rows just within the pellicle; paramylum in the form of 2 to several slender, elongate rods (sometimes with many short rods intermingled among the larger); flagellum short, ¼ or less of the cell in length; swimming without changing shape; cells 6.8–11.9 μ in diameter, 85–108 μ long. Pl. 4, Fig. 17, 18; Pl. 5, Fig. 5.

CZ–206; CZ–197. Rio Chagres.

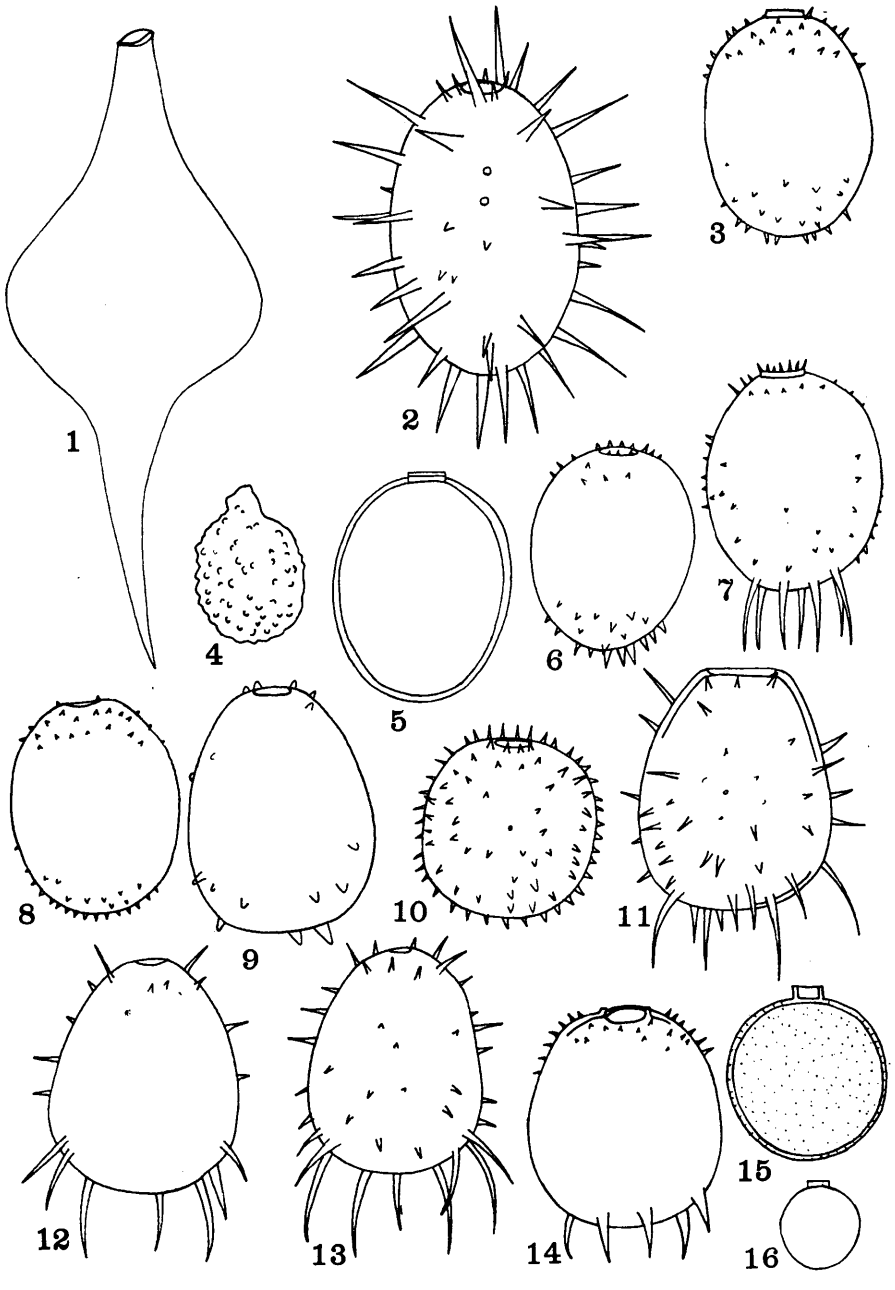
Euglena intermedia (Klebs) Schmitz

Cells elongate-cylindric, rather stout, little if at all narrowed anteriorly but broadly rounded and slightly bilobed at the apex, posteriorly narrowed abruptly to form a short, slightly curved caudus; pellicle spirally striated or smooth; chloroplasts numerous circular or oval discs; paramylum 2 large and long, or many shorter rods; flagellum less than ½ of the cell in length; swimming either straight and rigid or with metaboly; cells 12–17 μ in diameter (20 μ when contracted), 78–108 μ long. Pl. 5, Fig. 3, 4.

CZ–84. Pond in U. S. Government Experimental Gardens, C. Z.

EXPLANATION OF FIGURES IN PLATE II

1. *Trachelomonas ensifera* Daday.
2. *Trachelomonas spectabilis* Defl.
3. *Trachelomonas superba* Swir. Fa.
4. *Trachelomonas similis*. Stokes.
5. *Trachelomonas Lefevrei* var. levis var. nov.
6. *Trachelomonas armata* var. *Steinii* Lemm.
7. *Trachelomonas armata* var. *longispina* Playf.
8. *Trachelomonas hispida* var. *duplex* Playf.
9. *Trachelomonas armata* fa. *paucispina* fa. nov.
10. *Trachelomonas armata* var. *longispina* Playf.
11. *Trachelomonas armata* var. *ovata* fa. *truncata* fa. nov.
12. *Trachelomonas armata* var. *longispina* Playf.
13. *Trachelomonas armata* var. *longispina* Playf. Fa.
14. *Trachelomonas armata* var. *ovata* Swir.
15. *Trachelomonas Wermelii* Skv.
16. *Trachelomonas Wermelii* var. *paludosa* Skv.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Euglena longicaudata sp. nov.

Cells elongate-cylindric, slightly metabolic, broadly rounded and bilobed anteriorly with a prominent furrow extending nearly the entire length of the body, tapering posteriorly to a long, colorless, pointed tail-piece; membrane spirally striated with fine, double striae; chloroplasts very numerous, ovoid discs; paramylum bodies of various forms but usually 4 ovoid discs, sometimes lenticular, or rod-shaped bodies, two lying anterior and two posterior to the large ovoid, centrally placed nucleus; pyrenoids (?); a large vacuole just posterior to the groove in the anterior end; pigment-spot (?); 34–36 μ in diameter, 296–340 μ long. Pl. 3, Fig. 10–12.

CZ–87. Pond in U. S. Government Experimental Gardens.

This large species should be compared with *E. oxyuris* Schmarda and *E. antefossa* Johnson. From the latter it differs in the type and arrangement of the striations and in the shape of the paramylum bodies. Also the tail piece is much longer in the Panama specimens and the posterior end is more gradually tapering. *Euglena oxyuris* Schmarda has a different shape of paramylum grain and it also has a shorter, more abruptly tapering caudus. Drezepolski (1925) describes rather incompletely a similarly shaped species, *E. gigas*, which differs in having long narrow, rod-shaped paramylum bodies, and in not having the long, colorless tail-piece characteristic of the Panama organism.

Cellulae elongato-cylindricae, paululum metabolicae, antice late rotundatae atque bilobatae, sulco perspicuo paene per totam longitudinem corporis extenso praeditae, in caudam longam, incoloratam, acuminatam postice attenuatae; membrana striis tenuibus duplicibus spiraliter striata; chloroplasti plurimi, ovato-disciformes; grana paramylacea forma variantia, plerumque, autem, 4 ovato-disciformia, lenticularia aut bacilliformis, duobus anterioribus, duobus posterioribus nucleo magno centrali ovato adiacentibus; pyrenoidea (?); vacuola magma admodum posterior sulco in extremitate anteriore adiacente; stigma pigmenti (?); cellula 34–36 μ lat., 296–340 μ long.

Euglena oxyuris Schmarda

Cells elongate, subcylindrical and spirally twisted, truncate and broadly rounded at the anterior end, posteriorly tapering to a long, straight, colorless caudus; pellicle spirally striated; chloroplasts numerous oval platelets; paramylum in the form of two large, subcylindrical links and many smaller circular plates; flagellum about ⅓ of the cell in length; pigment-spot large and conspicuous; 40–71 μ in diameter, 170–192 μ long. Pl. 5, Fig. 11.

CZ–206. Rio Chagres.

Euglena polymorpha Dangeard

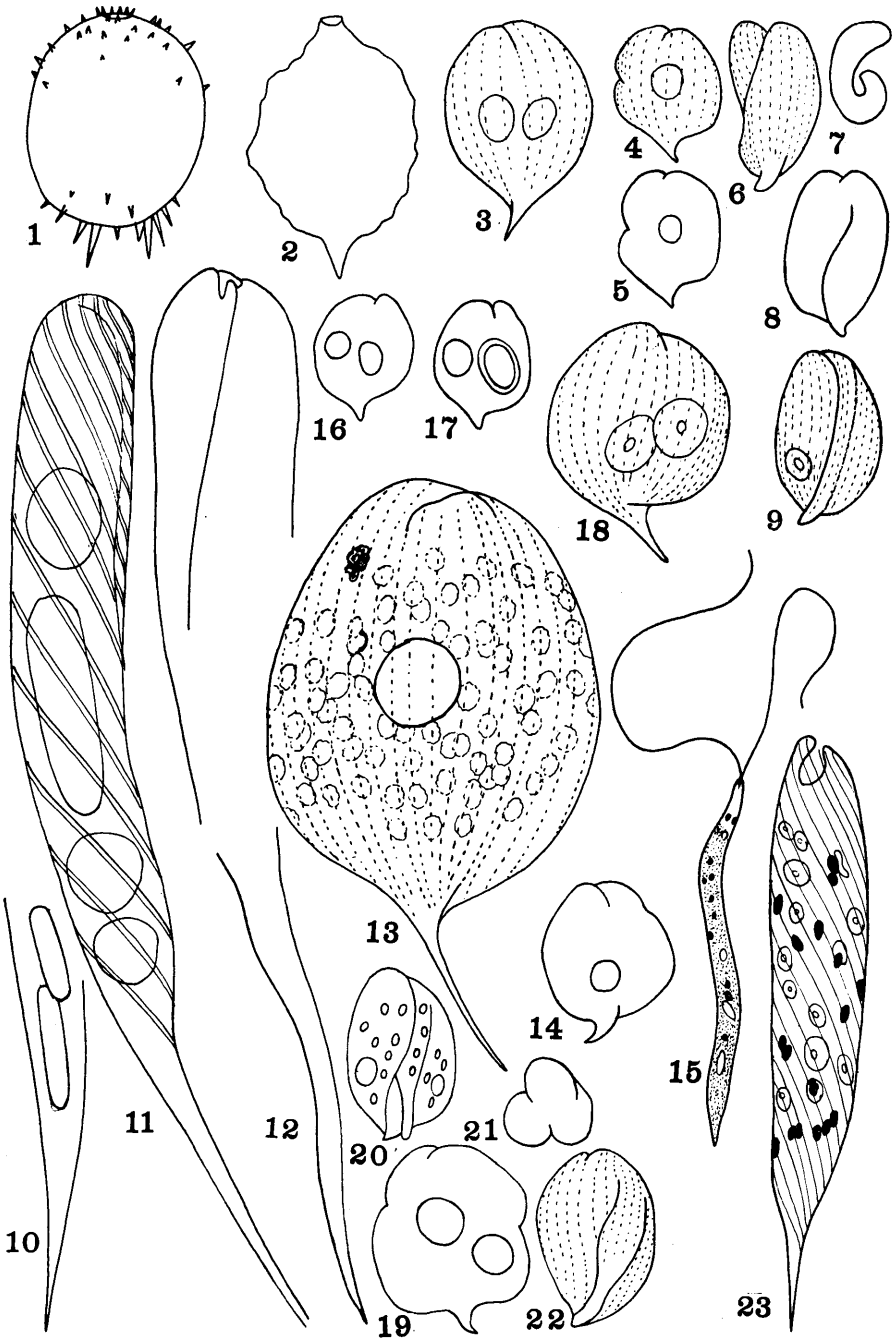
Cells broadly fusiform, somewhat abruptly narrowed anteriorly to a rounded, truncate apex, posteriorly gradually narrowed to a straight, colorless, sharply pointed caudus; pellicle spirally striated; chloroplasts several to many irregularly shaped platelets, containing a pyrenoid which is sheathed by a ring of paramylum bodies; flagellum 1¼ to 1½ times the cell in length; pigment-spot large and conspicuous, (in ours showing two large granules); 13.6–17.5 μ in diameter, 47.6–78 μ long. Pl. 4, Fig. 15, 20, 21.

CZ–209; CZ–214. Rio Chilibres; Rio Chagres.

In the same collections containing *E. polymorpha* were found several *Euglena* cysts (Pl. 5, Fig. 1, 2) which in shape, however, are quite different from those described for this species.

EXPLANATION OF FIGURES IN PLATE III

1. *Trachelomonas superba* var. *Swirenkiana* Defl.
2. *Trachelomonas tambowika* Swir.
3. *Phacus brachykentron* var. *caudatus* var. nov.
4–5. *Phacus incisus* sp. nov.
6–9. *Phacus curvicauda* Swir.
10–12. *Euglena longicaudata* sp. nov.
13. *Phacus ranulus* sp. nov.
14. *Phacus undulatus* fa. minor fa. nov.
15. *Eutreptia elongata* sp. nov.
16–17. *Phacus acuminatus* Stokes.
18. *Phacus orbicularis* Hübner.
19. *Phacus undulatus* (Skv.) Poch.
20–22. *Phacus curvicauda* Swir. Fa.
23. *Euglena pseudoxyuris* sp. nov.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Euglena proxima Dangeard

Cells fusiform, spindle-shaped, gradually narrowed anteriorly to a bluntly rounded apex, and posteriorly to a sharp point (without a caudus); pellicle spirally striated; chloroplasts numerous ovoid discs or circular plates; paramylum bodies numerous, short rods or elongate-oval grains; flagellum about 1½ times the cell in length; 18.7–23 μ in diameter, 51–71 μ long. Pl. 4, Fig. 16.

CZ–208. Rio Chagres.

Euglena pseudoxyuris sp. nov.

Cells elongate-cylindric, broadly rounded at the anterior end, tapering gradually posteriorly, then sharply tapering to form a colorless, sharp caudus; periplast only very slightly metabolic, rigid, with fine, irregular spiral striations; chloroplasts few, scattered, irregular plates; paramylum grains forming discs about the pyrenoids; flagellum (?); 17 μ maximum diameter, 100–105.4 μ long. Pl. 3, Fig. 23.

CZ–87. Pond, U. S. Government Experimental Gardens.

This species should be compared with *E. oxyuris* Schmarda which has differently shaped paramylum grains and is larger.

Cellulae elongato-cylindricae, antice late rotundatae, postice sensim attenuatae, deinde, ad caudam acutam, sine colore, efficiendam, abrupte attenuatae; periplastus minime metabolicus, rigidus, striis tenuibus, irregulariter patelliformes; grana paramylacea discos circum pyrenoidea formantia; flagellum (?); 17 μ max. diam., 100–105.4 μ long.

Euglena spirogyra Ehr.

Cells elongate-cylindric but somewhat flattened when seen from the side, broadly truncate and rounded at the anterior end, posteriorly tapering rather abruptly to a stout, sharply pointed caudus; periplast spirally striated with rows of pointed granules; chloroplasts numerous, plate-like bodies scattered through the cell; paramylum in the form of 2 large circular links, one to either side of the central nucleus; flagellum short, about ¼ the cell in length; 21 μ in diameter, 136 μ long (usually not so long). Pl. 5, Fig. 12.

CZ–197. Rio Chagres.

Euglena subthinophila sp. nov.

Cells broadly fusiform to elongate, fusiform-cylindric in motion and when extended, broadly truncate at the anterior end or somewhat produced at the apex; posteriorly tapering to a bluntly rounded, colorless point; flagellum twice as long or 2½ times the length of the cell, attached in a shallow reservoir; pellicle apparently smooth; chloroplasts numerous platelets scattered throughout the cell; pyrenoids 2 (?), free from the chloroplasts, sheathed by rings of paramylum; 10.2 μ in diameter, 23.8 μ long. Pl. 4, Fig. 19.

CZ–209. Rio Chilibres.

This species should be compared with *E. thinophila* Skuja which it resembles somewhat in shape, but from which it differs in respect to pyrenoids, chloroplasts, and in flagellum length.

Cellulae late fusiformes ad elongato-fusiformi-cylindricas (dum movent dumque extensae iacent), in extremitate anteriore late truncatae aut in apice paululum productae; postice in acumen incoloratum, obtuse rotundatum attenuatae; flagellum 2 vel 2½ plo longius quam

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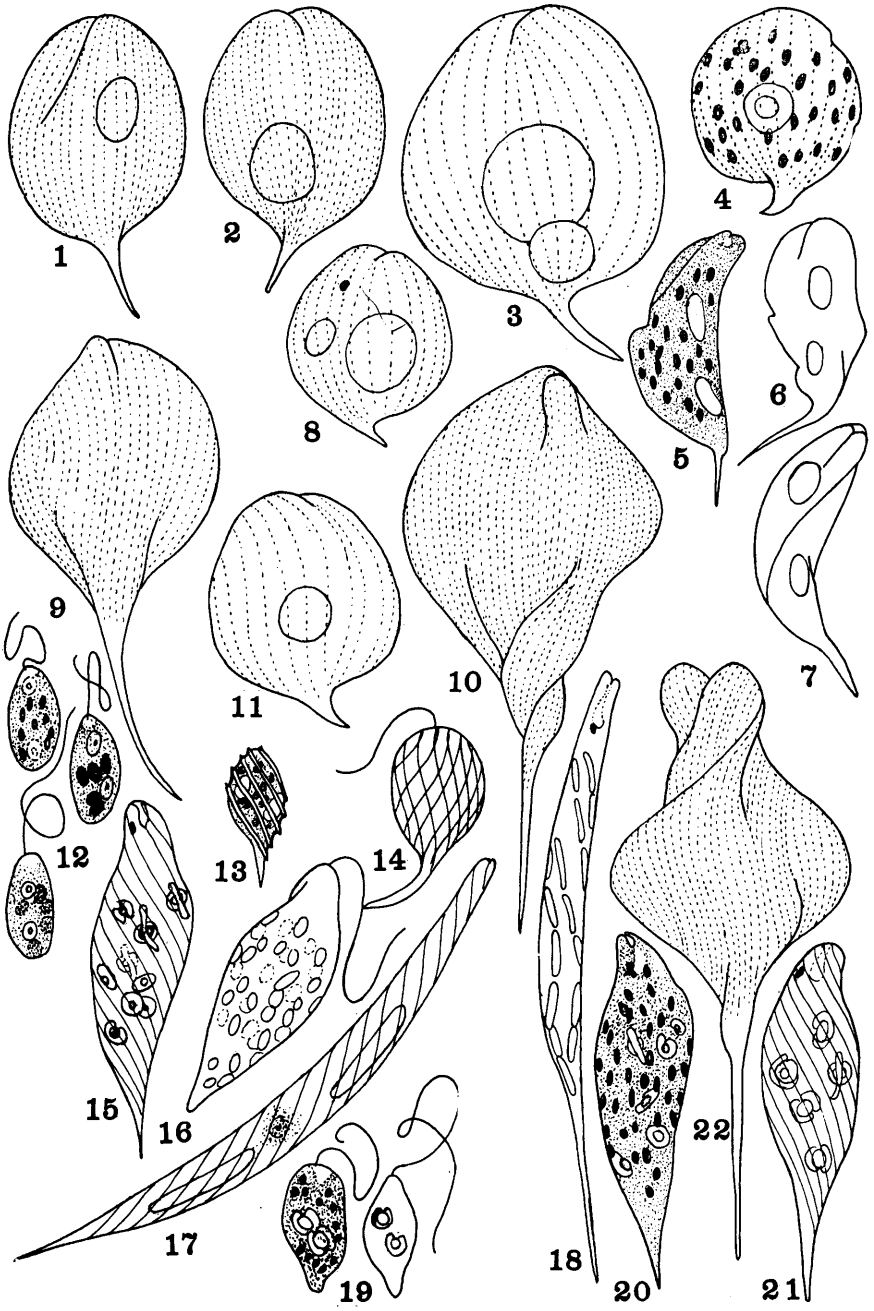
EXPLANATION OF FIGURES IN PLATE IV

1. *Phacus platalea* Drez.
2. *Phacus pleuronectes* (O. F. M.) Dui.
3. *Phacus triqueter* (Ehr.) Dui. Fa.
4. *Phacus pseudoswirenkoi* Presc. Fa.
5–7. *Phacus Raciborskii* Drez.
8. *Phacus Swirenkoi* Skv.
9. *Phacus tortus* (Lemm.) Skv.
10. *Phacus helikoides* Poch.
11. *Phacus orbicularis* Hübner
12. *Colacium vesiculosum* Ehr.
13. *Phacus pyrum* (Ehr.) Stein
14. *Lepocinclis ovata* Playf.
15. *Euglena polymorpha* Dang.
16. *Euglena proxima* Dang.
17–18. *Euglena acus* Ehr.
19. *Euglena subthinophila* sp. nov.
20-21. *Euglena polymorpha* Dang.
22. *Phacus helikoides* Poch.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longitudo cellulae, in fossa non alta affixum; pellicula ut videtur levis; chloroplasti lamellae numerosae per cellulam dispersae; pyrenoidea 2 (?), a chloroplastis seiuncta, per anulos paramyli vaginata; cellula 10.2 μ diam., 23.8 μ long.

Euglena velata Klebs

Cells broadly ellipsoid, or fusiform, rounded anteriorly, posteriorly tapering gradually to a blunt point; pellicle spirally and finely striated; chloroplasts numerous lobed and irregular plates containing a pyrenoid which has a sheath of paramylum, the paramylum also occurring as scattered, short, rod-like or oval bodies; flagellum nearly equal to the cell in length, 23.8 μ in diameter, 68.5 μ long. Pl. 5, Fig. 9, 10.

CZ–209. Rio Chilibres.

Phacus acuminatus Stokes Fa.

Cells angularly oval to sub-circular, broad in the basal part and narrowed abruptly to a short, sharply pointed caudus; pellicle longitudinally striated; chloroplasts numerous oval discs; paramylum 2 relatively large circular rings; flagellum about equal to the cell in length; 14 μ in diameter, 20.4 μ long. Pl. 3, Fig. 16, 17.

CZ–206. Rio Chagres.

This species seems to be similar to *P. acuminata* var. *Drezepolski* Skv. which Pochmann, (1942) has transferred to *P. caudatus* Hüb. Our specimens cannot be assigned to the latter, however.

Phacus brachykentron var. **caudatus** var. nov.

Cells oval or elliptic, broadly rounded anteriorly, narrowed abruptly posteriorly to form a sharp, slightly curved caudus; pellicle apparently smooth (striae invisible); paramylum 2 medium-sized rings; 28.8 μ in diameter, 40.8 μ long. Pl. 3, Fig. 3.

CZ–84. Pond in U. S. Government Experimental Gardens.

This variety differs from the typical by its somewhat larger size, the longer caudus and the (apparently) smooth pellicle.

Cellulae ovatae ellipticaeve, antice late rotundatae, postice, ad caudam acutam, paululum curvatum efficiendam, abrupte attenuatae; membrana, ut videtur, levis (striis invisibilibus); corpora paramylacea duo, mediocria, anuliformia; cellulae 28.8 μ diam., 40.8 μ long.

Phacus curvicauda Swir. Fa.

Cells broadly oval to nearly circular in outline, broadest at or below the midregion, tapering posteriorly abruptly to form a short, curved or deflected tail-piece; body with a flange on both the dorsal and ventral surfaces so that in cross section the cell is 2- or 3-lobed (apparently varying in this respect); pellicle longitudinally striate; chloroplasts numerous, scattered oval bodies; paramylum 2 large circular plates; 17.0 μ in diameter, 28.9 μ long. Pl. 3, Fig. 6–9; 20–22.

CZ–206. Rio Chagres.

Phacus helikoides Pochmann

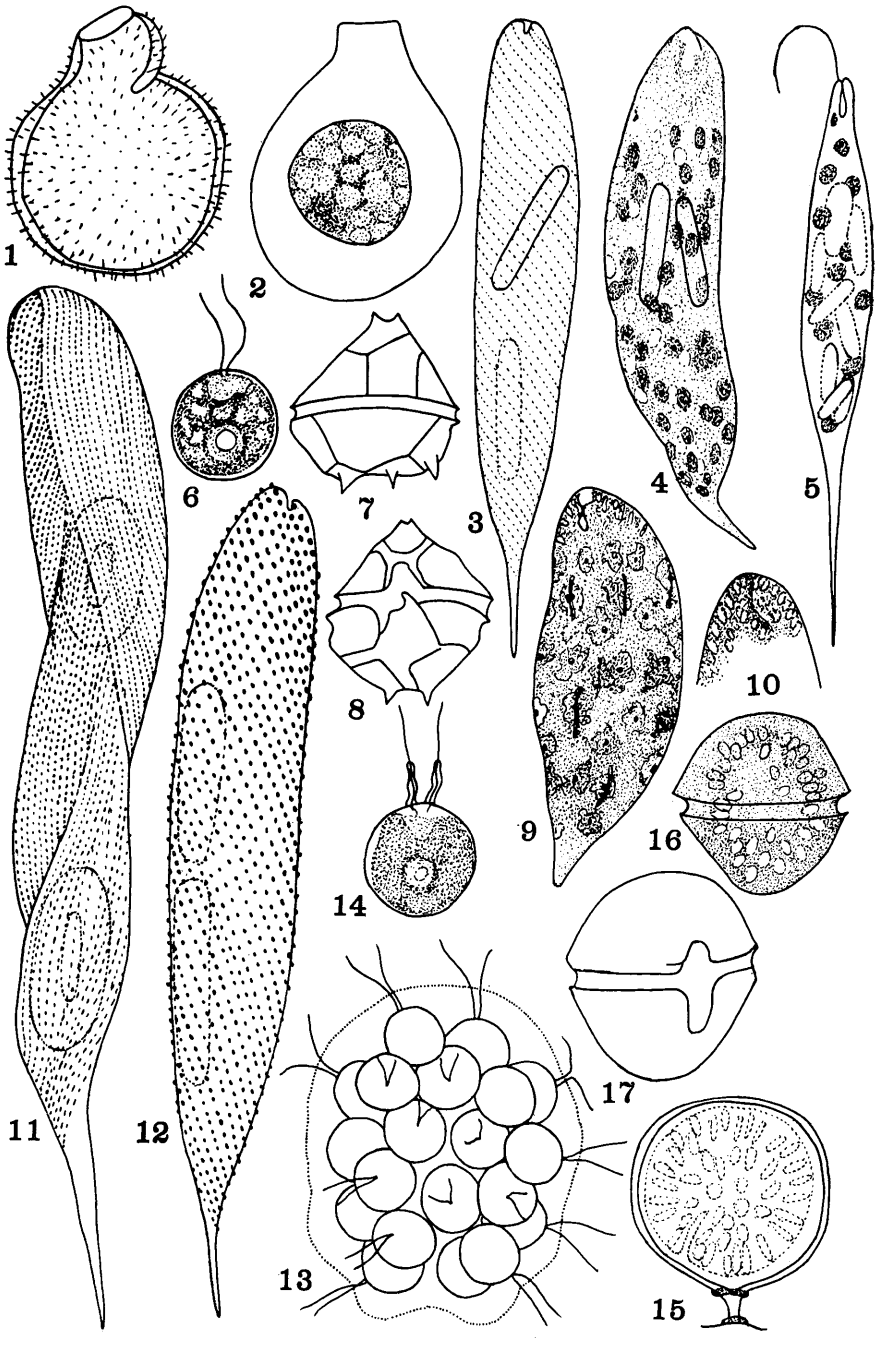
Cells pyriform, spirally twisted, bilobed anteriorly, broadest in the median region and then tapering and twisted into a long, straight caudus posteriorly; pellicle spirally striated longitudinally; 1 medianly placed paramylum plate; 40.8 μ in diameter, 105.4 μ long. Pl. 4, Fig. 22.

CZ–206. Rio Chagres.

This species has passed under the name of *P. tortus* var. *tortuosa* Skv.

EXPLANATION OF FIGURES IN PLATE V

1–2. *Euglena cysts.*
3–4. *Euglena intermedia* (Klebs) Schmitz.
5. *Euglena acus* Ehr.
6. *Chlamydomonas incerta* Pascher.
7–8. *Glenodinium quadridens* (Stein) Schiller.
9–10. *Euglena velata* Klebs.
11. *Euglena oxyuris* Schmar.
12. *Euglena Spirogyra* Ehr.
13–14. *Eudorina unicocca* G. M. Smith
15. *Stylodinium globosum* Klebs
16–17. *Glenodinium pulvisculus* (Ehr.) Stein.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Phacus incisus sp. nov.

Cells broadly rounded and slightly bilobed anteriorly, narrowed abruptly posteriorly into a short caudus which curves to the right; a sharp notch on the left margin of the cell; wall finely striated longitudinally; 1 large paramylum ring, medianly located; 18–19 μ in diameter, 23.8–25 μ long. Pl. 3, Fig. 4–5.

CZ–206. Rio Chagres.

This species should be compared with *P. undulatus* (Skv.) Pochmann which is larger and which has invaginations on both lateral margins; has two large paramylum grains.

Cellulae ovatae, antice paululum bilobatae atque late rotundatae, postice in caudam brevem, dextrorsum curvatum, abrupte attenuatae; margo sinister cellulae incisura acuta praeditus; membrana tenuiter, longitudinaliterque striata; corpus paramylaceum magnum, anuliforme, media in parte dispositus; cellulae 18–19 μ diam., 23.8–25 μ long.

Phacus orbicularis Hübner Fa.

Cells broadly ovate to suborbicular, broadly rounded anteriorly, posteriorly narrowed abruptly to a relatively long, sharp and curved or deflected caudus; pellicle longitudinally striated; paramylum bodies in the form of 2 large circular plates, 30.6–34 μ in diameter, 40.8 μ long. Pl. 3, Fig. 18; Pl. 4, Fig. 11.

CZ–84; CZ–86; CZ–94. Pond, U. S. Government Experimental Gardens; Rio Chagres.

Phacus platalea Drez.

Cells broadly oval, rounded anteriorly, posteriorly slightly spirally twisted and tapered to a curved, long and sharp caudus; flattened or concave on the ventral surface, convex dorsally; pellicle longitudinally striated; chloroplasts numerous circular plates; 1 large paramylum plate; 30.6 μ in diameter, 51 μ long. Pl. 4, Fig. 1.

CZ–206. Rio Chagres.

Phacus pleuronectes (O. F. M.) Duj. Fa.

Cells unsymmetrically oval or nearly orbicular, bilobed at the apex, slightly spiral posteriorly and tapered abruptly to a deflected, sharp caudus; pellicle longitudinally striated; paramylum grains 1 or 2 large circular plates; 30 μ in diameter, 47 μ long. Pl. 4, Fig. 2.

CZ–193. Rio Chilibres.

This species should be compared with *P. platalea* which is more elongate and more nearly symmetrical in shape.

Phacus pseudoswirenkoi Presc. Fa.

Cells orbicular, broadly rounded anteriorly, abruptly narrowed posteriorly to form a strongly deflected, sharp caudus; margin with one or two sharp notches on the right side; pellicle longitudinally striated; chloroplasts numerous oval bodies; 1 large circular paramylum plate; 30 μ in diameter, 37.4 μ long. Pl. 4, Fig. 4.

CZ–142. Pond near Frijoles, C. Z.

Phacus pyrum (Ehr.) Stein

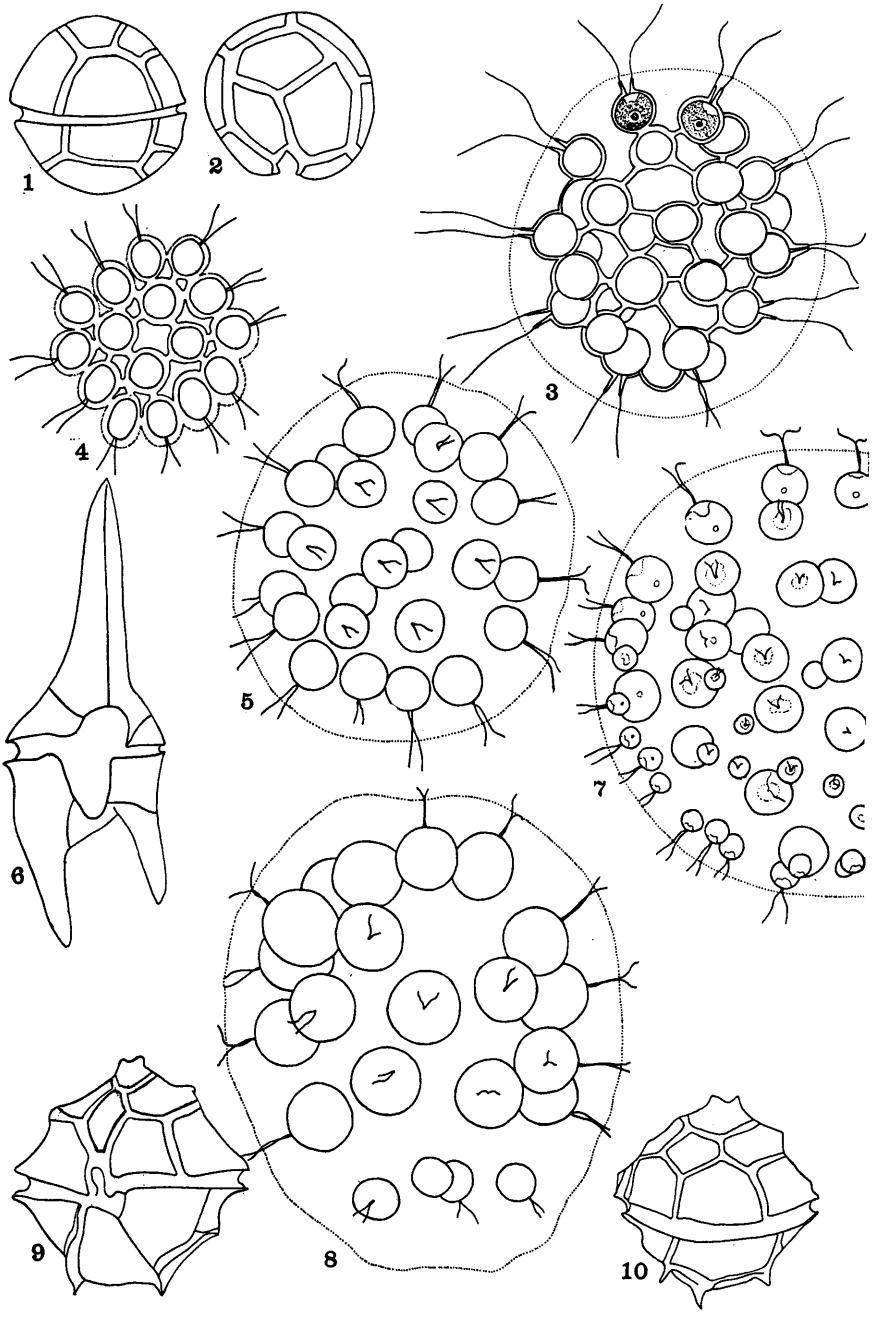
Cells small, broadly oval, narrowed posteriorly to a sharp, pointed and straight caudus; pellicle coarsely striated spirally; paramylum bodies 2 lateral discs (one on either side); flagellum about $\frac{2}{3}$ of the cell in length; 10 μ in diameter, 25.5 μ long. Pl. 4, Fig. 13.

CZ–206. Rio Chagres.

This species is questionably assigned to *P. pyrum*, but should be compared with *P. atraktoides* Poch., a synonym for a form of *P. pyrum* noted by Skvortzow (1937).

EXPLANATION OF FIGURES IN PLATE VI

1–2. *Gonyaulax palustre* Lemm.
3. *Eudorina interconnexa* sp. nov.
4. *Gonium pectorale* Müll.
5. *Eudorina elegans* Ehr.
6. *Ceratium hirundinella* (O. F. M.) Duj.
7. *Pleodorina californica* Shaw.
8. *Pleodorina illinoisensis* Kofoid.
9–10. *Peridinium bipes* Stein.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Phacus raciborskii Drez.

Cells unsymmetrically elliptical or pyriform, tapered posteriorly to form a curved and deflected caudus; dorsal surface with a flange so that the cell is irregularly 'V'-shaped in cross section; pellicle smooth or faintly striated longitudinally; lateral margin with a notch or emargination when seen from the 'front' (in ours); 13–16 μ in diameter, 44 μ long, including the caudus. Pl. 4, Fig. 5–7.

CZ–206. Rio Chagres.

Phacus ranulus sp. nov.

Cells broadly ovoid, broadly rounded anteriorly and with a fold near the gullet; narrowed posteriorly to a long, tapering, curved caudus; pellicle longitudinally striated; 1 large, median paramylum plate; 54.4 μ in diameter, 95.2 μ long. Pl. 3, Fig. 13.

CZ–206. Rio Chagres.

This species should be compared with *P. gigas* Da Cunha which is more nearly orbicular and has many small paramylum grains.

Cellulae ovatae, late rotundatae, plicamque prope gulam habentes, postice ad caudam longam, fastigatam, curvatam attenuatae; periplastus longitudinaliter striatus, corpus paramylaceum unicum, magnum, medium anuliforme; cellulae 54.5 μ diam., 95.2 μ long.

Phacus Swirenkoi Skvortzow

Cells broadly oval or suborbicular, unsymmetrically tapered posteriorly and twisted to form a short, sharply deflected caudus; with a dorsal flange so that the cell is irregularly triangular in end view; pellicle longitudinally striated; paramylum bodies 1 or 2 medium-sized plates; 27.2–30.6 μ in diameter, 34 μ long. Pl. 4, Fig. 8.

CZ–215; CZ–193. Rio Chagres; Rio Chilibres.

Phacus tortus (Lemm.) Skvortzow

Cells pyriform in the body but spirally twisted and tapering to a long straight caudus posteriorly; bilobed at the apex; pellicle longitudinally striated; paramylum grains variable, usually one very large, median, circular plate; 40–48 μ in diameter, 95–100 μ long. Pl. 4, Fig. 9.

CZ–142. Pond near Frijoles, C. Z.

Phacus triqueter (Ehr.) Duj. Fa.

Cells broadly ovate, the margins unsymmetrically convex, with a flange on the dorsal surface so that the cell is triangular in cross section; tapered posteriorly to a relatively long, curved, sharp caudus; pellicle longitudinally striated; chloroplasts numerous circular plates; 2 large paramylum rings; 47.6 μ in diamter, 68 μ long. Pl. 4, Fig. 3.

CZ–79. Pond, U. S. Government Experimental Gardens.

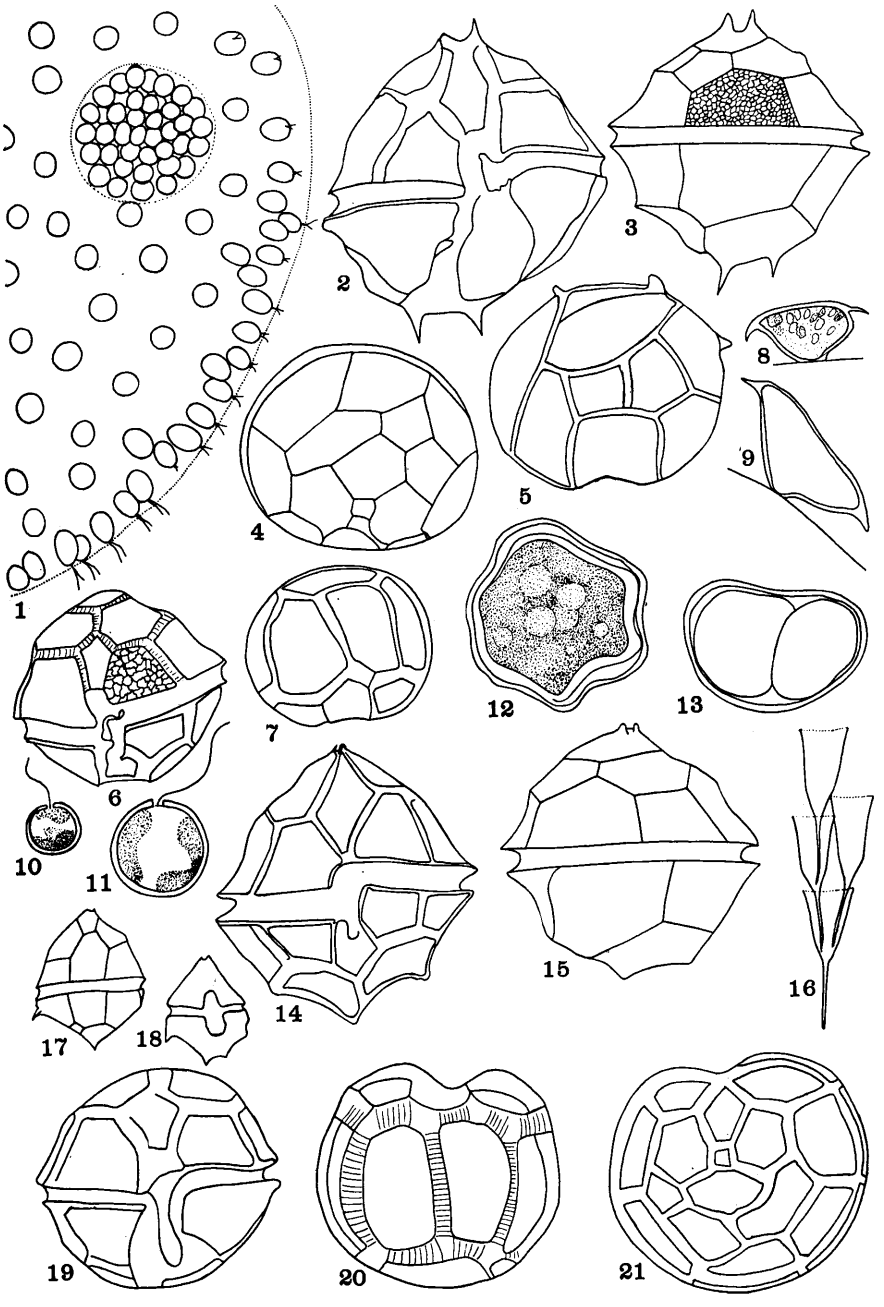
Phacus undulatus (Skv.) Pochmann

Cells broadly oval, broadly rounded anteriorly, broadest in the basal region which is abruptly narrowed to form a short, bluntly pointed caudus; lateral margins of the cell incised or emarginate to form undulations; pellicle finely striated longitudinally; chloroplasts numerous scattered circular bodies; paramylum in the form of 2 circular plates, one often much larger than the other; 27.2 μ in diameter, 34 μ long. Pl. 3, Fig. 19.

CZ–86. Pond, U. S. Government Experimental Gardens.

EXPLANATION OF FIGURES IN PLATE VII

1. *Volvox aureus* Ehr.
2–5. *Peridinium bipes* Stein.
6–7. *Peridinium gatunense* Ostenfeld & Nygaard.
8–9. *Raciborski bicornis* Wolosz.
10–11. *Chrysococcus rufescens* Klebs.
12–13. *Dinoflagellate cysts.*
14–15. *Peridinium Gutwinskii* Wolosz.
16. *Proteriodendron petiolatum* var. *Abbottii* (Stokes) Playf.
17–18. *Peridinium inconspicuum* Lemm.
19. *Peridinium Volzii* Lemm.
20–21. *Peridinium Gutwinskii* Wolosz.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Phacus undulatus fa. **minus** fa. nov.

Cells broadly ovoid, with a short, deflected tail-piece; margin with a shallow notch or invagination on either side near the anterior end; pellicle scarcely if at all striated; paramylum body a single, circular plate; 23.8 μ in diameter, 27.2 μ long. Pl. 3, Fig. 14.

CZ–142. Pond near Frijoles, C. Z.

Cellulae latae ovatae, caudam brevem, deflectam, et marginem incisura vadosa vel invaginatione utrinque prope extremitatem anteriorem haventes; membrana vix aut haud striata; corpus paramylaceum unicum; cellulae 23.8 μ lat., 27.2 μ long.

Lepocinclis ovata (Playf.) Conrad

Cells oval or ovate-pyriform, broadly rounded anteriorly, rather abruptly tapered posteriorly to form a long straight or curved caudus; pellicle coarsely striated with spiral lines; 2 paramylum rings, one on either side of the cell; 17 μ in diameter, 34 μ long. Pl. 4, Fig. 14.

CZ–208. Rio Chagres.

Trachelomonas armata var. **longispina** Playf., emend. Deflandre

Test broadly oval or subpyriform (slightly narrowed at the anterior end); wall unevenly beset with sharp, slender spines (variable in number and disposition) but with basal spines much longer, stouter and all directed posteriorly; 38–40 μ in diameter, 38–51 μ long (including spines). Pl. 2, Fig. 7, 12, 13.

Trachelomonas armata var. **ovata** Swir.

Test broadly oval or ovate, with a slight thickening about the flagellum aperture; wall beset with sharp spines in the anterior region, smooth in the main body, but with a number of stout posteriorly projecting spines in the basal region; 31 μ in diameter, 37.4 μ long. Pl. 2, Fig. 14.

CZ–142. Pond near Frijoles, C. Z.

Trachelomonas armata var. **oavta** fa. **truncata** fa. nov.

Test pyriform, broadly truncate at the anterior end, enlarged and broadly rounded posteriorly; posterior spines 6–8 μ long and hooked, the wall almost evenly beset with shorter, straight spines which are all about the same length; 34 μ in diameter, 51 μ long. Pl. 2, Fig. 11.

CZ–84. Pond, U. S. Government Experimental Gardens.

Test pyriformis, antice late truncata, postice amplificata et late rotundata; spinae posteriores 6–8 μ long., uncinatae, membrana spinis brevioribus, rectis, satis aequilongis fere aequaliter obsita; cellula 34 μ lat., 51 μ long.

Trachelomonas armata fa. **paucispina** fa. nov.

Test pyriform, narrow anteriorly and broadly rounded to somewhat truncate; 2 or 3 short, stout, irregularly placed spines at the posterior pole; posterior and anterior regions sparsely beset with very short, sharp spines, a ring of spines about the flagellum aperture; 32.3 μ in diameter, 40.8 μ long. Pl. 2, Fig. 9.

CZ–196. *Salvinia* beds, Rio Chagres.

Testa pyriformis, antice angusta atque late rotundata ad satis truncatam; spinae crassae ad polam posteriorem irregulariter dispositae; pars posterior atque pars anterior spinis brevissimis, acutis, sparse obsitae, anulo spinarum circum aperturam flagelli ordinato; cellula 32.3 μ diam., 40.8 μ long.

Trachelomonas armata var. **Steinii** Lemm.

Test broadly oval to nearly spherical; spines relatively short and often blunt, mostly occurring in the anterior and posterior regions, the midregion almost smooth; 28.9–29.6 μ in diameter, 34–35 μ long. Pl. 2, Fig. 6.

CZ–84; CZ–139; P–11. Pond, U. S. Government Experimental Gardens; ditch near R. R. track, Frijoles, C. Z.

Trachelomonas cylindrica Ehr.

Test short-cylindric, the lateral margins parallel, the poles symmetrically rounded; flagellum aperture with a smooth collar; wall smooth and colorless or light brown, 10.5 μ in diameter, 16.7 μ long. Pl. 1, Fig. 16.

CZ–214. Plankton in Rio Chagres, Juan Mina.

Trachelomonas cylindrica var. **decollata** Playf.

Test elongate-cylindric, the anterior end somewhat truncate, the posterior pole narrowly rounded; flagellum aperture with a slight thickening; wall smooth, colorless or light yellow; 6.8 μ in diameter, 17 μ long. Pl. 1, Fig. 2, 3.

Trachelomonas Dybowskii Drez.

Test broadly oval; wall smooth; flagellum aperture with a thickening but without a distinct collar; 20.4–23.8 μ in diameter, 23–25 μ long. Pl. 1, Fig. 10.

CZ–196; CZ–82. Pond, U. S. Government Experimental Gardens; *Salvinia* beds, Rio Chagres.

A form nearly spherical (Pl. 1, Fig. 11) was found in the plankton of Gatun Lake.

Trachelomonas ensifera Daday

Test broadly fusiform, somewhat abruptly produced anteriorly to form a long neck and abruptly narrowed posteriorly to form a long sharply pointed caudus, some cells transversely oval in the body; mouth of the flagellum aperture beset with teeth-like projections (sometimes absent); wall smooth, colorless or light yellow; 37–44 μ in diameter, 85–102 μ long. Pl. 2, Fig. 1.

CZ–196; CZ–206. *Salvinia* beds, Rio Chagres, Juan Mina.

Trachelomonas ensifera fa. **dentifera** fa. nov.

A form not so broadly fusiform, oval, gradually narrowed above to a long neck with a ring of prominent teeth about the flagellum aperture; more abruptly narrowed posteriorly to a long, straight, spine-like extension; test colorless to light brown, smooth; 37–39 μ in diameter, 85–88 μ long. Pl. 1, Fig. 1.

CZ–196. *Salvinia* beds, Rio Chagres, Juan Mina.

Testa ovato-fusiformis, superne ad collum longum sensim attenuata, collum anulo dentium prominentium circum aperturam flagelli praeditum; postice ad extensionem longam, rectam, spiniformen abruptius attenuata; testa sine colore ad pallide brunneam, levis; cellula 37–39 μ diam., 85–88 μ long.

Trachelomonas fluviatile var. **curvata** Lemm.

Test broadly oval, briefly produced anteriorly to form a neck, and abruptly narrowed posteriorly to form a long, straight caudus; wall smooth; 29.6 μ in diameter, 74 μ long. Pl. 1, Fig. 22.

CZ–160. Pond near R. R., Gatun, C. Z.

Trachelomonas fluviatilis var. **curvicauda** var. nov.

Test broadly oval with a short, relatively wide neck; abruptly narrowed posteriorly to a short, sharp and strongly deflected caudus; 22 μ in diameter, 39 μ long. Pl. 1, Fig. 12.

CZ–68. Plankton, Rio Coccoli.

Testa late ovata, collo brevi atque relative lato; postice ad caudam brevem, acutam, valdeque deflectam, abrupte attenuata; cellula 22 μ diam., 39 μ long.

Trachelomonas fluviatilis var. **rugosa** var. nov.

Test asymmetrically oval, somewhat gradually narrowed above to a short, wide neck, and posteriorly more abruptly tapered to a straight, pointed caudus; wall light brown and distinctly rugose; 23.8–30.6 μ in diameter. 64–68 μ long. Pl. 1, Fig. 25, 26.

CZ–196. *Salvinia* beds, Rio Chagres, Juan Mina.

Testa asymmetrice ovata, antice ad collum breve. latum quasi sensim attenuata, postice ad caudam rectam, acuminatam abruptius attenuata; membrana pallide brunnea, perspicue rugosa; cellula 23.8–30.6 μ diam., 64–68 μ long. cum cauda.

Trachelomonas hispida (Perty) Stein Fa.

Test broadly oval; the wall evenly beset with numerous short, sharp spines; flagellum aperture with a slight thickening which is smooth; 27.2 μ in diameter, 35 μ long. Pl. 1, Fig. 18.

CZ–134. Pond near R. R., Frijoles, C. Z.

Trachelomonas hispida var. **coronata** Lemm.

Test ovoid, evenly beset with fine spines; flagellum aperture with a short collar with a fringe of short spines; 22.1 μ in diameter, 35 μ long. Pl. 1, Fig. 23.

CZ–196. *Salvinia* beds, Rio Chagres, Juan Mina.

Trachelomonas hispida var. **duplex** Playf.

Test broadly oval; anterior and posterior regions with short, sharp spines, median region smooth; flagellum aperture without a collar; 23.8 μ in diameter, 37.8 μ long. Pl. 2, Fig. 8.

CZ–44. Gigante Bay, Gatun Lake.

Trachelomonas hispida var. **papillata** var. nov.

Test broadly ovoid, beset with short papillate spines; flagellum aperture a smooth opening; wall yellowish; 17 μ in diameter, 23.8 μ long. Pl. 1, Fig. 19, 29.

CZ–215. Rio Chagres, Juan Mina.

Testa late ovata, subflava, spinis brevibus, papillatis sparse obsita; apertura flagelli levis, circularis; cellula 17 μ diam., 23.8 μ long.

Trachelomonas hispida var. **punctata** Lemm.

Test oval; wall densely punctate and slightly roughened but otherwise smooth; flagellum aperture with a slight thickening; 18.2 μ in diameter, 27.2 μ long. Pl. 1, Fig. 15.

CZ–101. *Utricularia* bed, Rio Chagres.

Trachelomonas intermedia Dang.

Test ovoid; wall finely punctate, yellowish-brown; flagellum aperture with a smooth thickening; 17 μ in diameter, 20.4 μ long. Pl. 1, Fig. 13.

CZ–215. Rio Chagres, Juan Mina.

Trachelomonas Kelloggii var. **punctata** Skv.

Test broadly ovoid; wall densely and coarsely punctuate, yellow-brown; flagellum aperture with a thickened, smooth ring; 23.5 μ in diameter, 28.9 μ long. Pl. 1, Fig. 9.

CZ–197. Rio Chagres, Juan Mina.

Trachelomonas Lefevrei var. **levis** var. nov.

Test broadly oval or oval-ellipsoid, with a short collar around a relatively wide flagellum aperture; wall smooth, colorless; 30.6 μ in diameter, 40.8 μ long. Pl. 2, Fig. 5.

CZ–79. Pond, U. S. Government Experimental Gardens.

Testa late ovata ovato-ellipsoidea, collari brevi circum flagelli aperturam relative latam praedita; membrana levis, sine colore; cellula 30.6 μ diam., 40.8 μ long.

Trachelomonas Manginii Defl.

Test oval, sometimes slightly narrowed posteriorly; flagellum aperture with a short, smooth collar; wall almost colorless, smooth; 18.7 μ in diameter, 23.8 μ long. Pl. 1, Fig. 4.

CZ–206. Juan Mina, Rio Chagres.

Trachelomonas napiformis sp. nov.

Test smooth, vasiform, napiform with a long, stout, straight caudus tapering from a broad basal portion; anteriorly tapering gradually into a long neck with sides slightly undulate and ending in a flagellum aperture which has a toothed rim; test with (2)–3 transverse ring-like swellings just above the broader region of the cell; 40–42 μ in diameter, 105–110 μ long. Pl. 1, Fig. 27–28.

CZ–196. *Salvinia* beds, Rio Chagres.

Testa levis, vasiformi-napiformis, cauda longa, crassa, recta, a parte basali lata attenuata praedita; antice in collum longum, lateribus subundulatis, sensim attenuata, et ad aperturam flagelli, ora dentata praeditam, terminata; test (2)–3 inflationibus transversis, anuliformibus admodum super partem latam praedita; cellula 40–42 μ diam., 105–110 μ long.

Trachelomonas oblonga Lemm.

Test broadly or narrowly oval, symmetrically rounded at both poles; flagellum aperture with a slight internal thickening (in ours); wall smooth, brown; 13.6 μ in diameter, 16.5 μ long. Pl. 1, Fig. 5.

CZ–142. Pond near Frijoles, C. Z.

Trachelomonas oblonga var. **attenuata** Playf.

Test oval, somewhat truncate at the anterior end; flagellum aperture with a low, smooth collar; wall smooth, pinkish-brown; 9.8 μ in diameter, 13.6 μ long. Pl. 1, Fig. 6, 7.

CZ–206. Juan Mina, Rio Chagres.

Trachelomonas pisciformis sp. nov.

Test broadly ovoid, tapering abruptly posteriorly to form a long caudus with subparallel, smooth margins, ending in 2 stout spines or bifurcations; anteriorly briefly tapering to form a short neck in which the flagellum aperture is located, with 4 stout diverging spines at its rim; test sparsely beset with both long and stout, short spines; 17.5 μ in diameter without spines, 27 μ in diameter including spines; 54.4 μ long including spines. Pl. 1, Fig. 20.

CZ–214. Juan Mina, Rio Chagres.

Testa late ovata, postice ad caudam longam marginibus subparallelibus levibusque efficiendam, abrupte attenuata, cauda in 2 spinas crassas aut bifurcationes terminate; antice ad collum breve efficiendum breviter attenuata, collum habens aperturam flagelli, ad oram 4 spinas crassis divergentibusque praeditam; testa spinis longis crassisque, brevibus acutisque sparse obsita; cellula 17.5 μ diam. sine spinis, 27 μ cum spinis, 54.4 μ long. cum spinis.

Trachelomonas pulcherrima var. **elevatum** var. nov.

Test oblong-ovate to nearly cylindric, truncate and depressed at the anterior end, with sharp lateral shoulders; flagellum aperture in a short smooth collar; wall smooth, light brown; 7 μ in diameter, 16.8 μ long. Pl. 1, Fig. 30, 31.

CZ–206. Juan Mina, Rio Chagres.

Testa oblong-ovata ad subcylindricam, in extremitate anteriore, humeris lateralibus acutis, truncata depressaque; apertura flagelli intra collare breve leveque; membrana levis, dilute brunnea; cellula 7 μ diam., 16.8 μ long.

Trachelomonas pulcherrima var. **latior** fa. **collarita** fa. nov.

Test narrowly ovoid; wall smooth; flagellum aperture with a low collar; 10.2 μ in diameter, 20.4 μ long. Pl. 1, Fig. 24.

CZ–197. Juan Mina, Rio Chagres.

Testa anguste ovata, levis; apertura flagelli collari humili praedita; cellula 10.2 μ diam., 20.4 μ long.

Trachelomonas scabra var. **longicollis** Playf.

Test oval to subcyclindric; wall rugose and coarsely lumpy; flagellum aperture in a short deflected neck with a smooth rim; 17 μ in diameter, 27.2 μ long. Pl. 1, Fig. 8.

CZ–206. Juan Mina, Rio Chagres.

Trachelomonas speciosa var. **spinosa** var. nov.

Test fusiform, tapering posteriorly to a stout caudus which bears 3 long, stout furcations and anteriorly to a broad flagellum opening with 4 (or 5) stout spines at the margin; surface of test sparsely beset with stout spines; 23.8 μ in diameter, 51 μ long. Pl. 1, Fig. 17.

CZ–197. Juan Mina, Rio Chagres.

Testa fusiformis, postice ad caudam crassam, 3 furcationes longas crassasque ferentem, attenuata; antice ad aperturam flagelli latam, in margine 4 (vel 5) spinis crassis praeditam, attenuata; superficies testae spinis crassis praeditam, attenuata; superficies testae spinis crassis sparsim obsita; cellula 23.8 μ diam., 51 μ long.

Trachelomonas similis Stokes

Test broadly ovoid, roughened irregularly, produced anteriorly into a short, curved collar with a smooth but oblique margin; 13.6 μ in diameter, 23.8 μ long. Pl. 2, Fig. 4.

CZ–197. Juan Mina, Rio Chagres.

Trachelomonas spectabilis Defl.

Test oval, poles symmetrically rounded; wall brown, rather evenly beset with long stout spines; flagellum aperture with a rim of short spines; 51 μ in diameter, 65–68 μ long with spines. Pl. 2, Fig. 2.

CZ–87; CZ–206. Pond, U. S. Government Experimental Gardens; Juan Mina, Rio Chagres.

Trachelomonas subflava sp. nov.

Test ovoid, light straw-colored; wall coarsely punctate, sparsely beset with fine, sharp spines which are slightly longer in the posterior part of the test; flagellum aperture in a short collar which has diverging lateral margins and a smooth rim; 23.8 μ in diamterer, 35.7 μ long. Pl. 1, Fig. 21.

CZ–215. Rio Chagres.

Testa ovata, pallide straminea colore, crasse punctata, spinis tenuibus acutis, parte in posteriore paulo longioribus, sparse obsita apertura flagelli collare breve, marginibus lateralibus divergentibus oraque levi praeditum, habens; cellula 23.8 μ diam., 35.7 μ long.

Trachelomonas superba Swir. Fa.

Test broadly oval; wall brown with a few scattered, short spines and with more densely arranged spines near the posterior pole; flagellum aperture with a low collar that has a smooth margin; 30.6 μ in diameter, 40.8 μ long. Pl. 2, Fig. 3.

CZ–196. *Salvinia* beds, Rio Chagres.

Trachelomonas superba var. **Swirenkiana** Defl.

Test broadly oval; wall brown, beset with spines near the anterior and posterior poles, those in the posterior region being distinctly longer; flagellum aperture without a rim or collar but with the margin beset with a ring of small spines; 27.2 μ in diameter, 42.5 μ long. Pl. 3, Fig. 1.

CZ–211. Rio Chagres.

Trachelomonas tambowika Swir.

Test fusiform, abruptly narrowed anteriorly to form a short, relatively wide neck and flagellum aperture, and likewise tapered posteriorly to form a short, stout caudus; wall light brown or tan to nearly colorless, irregularly corrugated and crinkled; 30.6 μ in diameter, 44 μ long. Pl. 3, Fig. 2.

CZ–142. Pond near R. R., Frijoles, C. Z.

Trachelomonas volvocina Ehr.

Test globular or nearly so; wall light brown or yellowish, smooth (some forms punctate); flagellum opening a smooth circle, sometimes with a slight marginal swelling; 17 μ in diameter, 18–20.4 μ long. Pl. 1, Fig. 14.

CZ–84. Pond, U. S. Government Experimental Gardens.

Trachelomonas Wermelii Skv.

Test globular; wall brown, rather thick and conspicuously punctate; flagellum aperture in a high collar with parallel lateral margins; 27.2 μ in diameter, 27.2 μ long. Pl. 2, Fig. 15.

CZ–206. Juan Mina, Rio Chagres.

Trachelomonas Wermelii var. **paludosa** Skv. Fa.

Smaller than the typical, wall brown and smooth; 13.6 μ in diameter, 15.5 μ long. Pl. 2, Fig. 16.

CZ–84. Pond, U. S. Government Experimental Gardens.

Colacium vesiculosum Ehr.

Cell ovate-fusiform, changing shape in motion, becoming attached anterior end downward, forming a gelatinous attaching stalk and forming branched colonies through cell division; chloroplasts several to many ovoid plates; pyrenoids with a sheath of paramylum (usually 2 showing in each cell); pigment spot anterior and lateral; flagellum about as long as the cell; 8.5–10 μ in diameter, 18.7 μ long. Pl. 4, Fig. 12.

CZ–209. Rio Chilibres.

This organism is usually found attached to microcrustacea and other small animals; forming plume-like or gregarious colonies; seldom is found swimming free.

Eutreptia elongata sp. nov.

Cells elongate, fusiform-cylindric, narrowed gradually anteriorly to a bilobed apex, posteriorly rather abruptly tapering to a sharp point; chloroplasts few, disc-shaped; paramylum 3 to several small scattered rods; flagella 2, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the cell; 5.1 μ in diameter, 61 μ long. Pl. 3, Fig. 15.

CZ–206. Juan Mina, Rio Chagres.

Cellulae elongatae, fusiformi-cylindricae, antice ad apicem bilobatum sensim attenuatae, postice ad acumen abruptis attenuatae; chloroplasti pauci, disciformes; bacilli paramylaceparvi 3 vel plures, sparsi; flagella $\frac{2}{3}$ ad $\frac{3}{4}$ cellulae longitudinis; cellulae 5.1 μ diam., 61 μ long.

PYRRHOPHTYA

Glenodinium pulvisculus (Ehr.) Stein

Cell globular, 30.6 μ in diameter, 30.6 μ long. Pl. 5, Fig. 16, 17.

CZ–196. *Salvinia* beds, Rio Chagres.

Glenodinium quadridens (Stein) Schiller

Cells ovate, epitheca cone-shaped; 31 μ in diameter, 44.4 μ long. Pl. 5, Fig. 7, 8.

CZ–18; CZ–41. Madden Lake; Gigante Bay, Gatun Lake.

Peridinium bipes Stein

Cells nearly globular in 'front' view, slightly compressed when seen from the side; 61 μ in diameter, 68 μ long. Pl. 6, Fig. 9, 10.

CZ–4; CZ–34; CZ–48. Gigante Bay and Laboratory Bay, Gatun Lake.

Peridinium gatunense Ostenfeld & Nygaard

Cells nearly globular; 47.6 μ in diameter, 44.2 μ long. Pl. 7, Fig. 6, 7.

CZ–38; CZ–48. Gigante Bay, Gatun Lake.

Peridinium Gutwinski Wolosz.

Cells globular; 57 μ in diameter, 61.2 μ long. Pl. 7, Fig. 14, 15; 20, 21.

CZ–40; CZ–55; CZ–104. Plankton, Gatun Lake; Gigante Bay.

Peridinium inconspicuum Lemm.

Cells fusiform, small, the plates faintly discernible; 18.5 μ in diameter, 25.9 μ long. Pl. 7, Fig. 17, 18.

Pan–11. Pond near Frijoles, C. Z.

Peridinium Volzii Lemm.

Cells nearly globular, both poles symmetrically rounded; 63 μ in diameter. Pl. 7, Fig. 19.

Pan–34. Gigante Bay, Gatun Lake.

Gonyaulax palustre Lemm.

Cells globular; both poles symmetrically rounded, round in lateral view; 40.7 μ in diameter. Pl. 6, Fig. 1, 2.

Pan–11. Pond near Frijoles, C. Z.

Ceratium hirundinella (O. F. M.) Duj.

Cells fusiform; anterior end tapering to form a long horn; posteriorly with 2 or 3 horns (in ours with 2 horns only); 60–80 μ in diameter, 150–200 μ long. Pl. 6, Fig. 6.

Pan–2; CZ–142. Plankton, Gatun Lake; Pond near Frijoles, C. Z.

Raciborskia bicornis Wolosz.

Cells triangular in 'front' view, attached by a narrow base, the free angles bearing a curved spine; 9–12 μ in diameter, 25 μ long including spines. Pl. 7, Fig. 8, 9.

CZ–85. U. S. Government Experimental Gardens.

Stylodinium globosum Klebs

Cells globular, on an attaching stipe with a thickened plug at the base of the cell proper; chloroplast brownish-green, parietal, cells 31 μ in diameter. Pl. 5, Fig. 15.

CZ–134. Pond near Frijoles, C. Z.

CHRYSOPHYTA

Chrysococcus rufescens Klebs

Cells globular; shell brown with a minute flagellar opening; chromatophores 2 or 3 faintly pigmented bodies; flagellum about equal to the diameter of the cell; leucosin (?) bodies conspicuous; cells 4–8 μ in diameter. Pl. 7, Fig. 10,11.

CZ–214. Plankton, Rio Chagres, Juan Mina.

PROTOMASTIGINEAE

Proteriodendron petiolatum var. **Abbottii** (Stokes) Playf.

Lorica vase-shaped, narrowed below to a long, spine-like base, one or two loricas arising from one below to form short branching chains; 6.8 μ in diameter, 15 μ long without stipe, 34 μ long with stipe. Pl. 7, Fig. 16.

CZ–206. Juan Mina, Rio Chagres.

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